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# *PARADULCEDO*, A NEW GENUS OF SATYRINAE (NYMPHALIDAE) FROM WESTERN COLOMBIA

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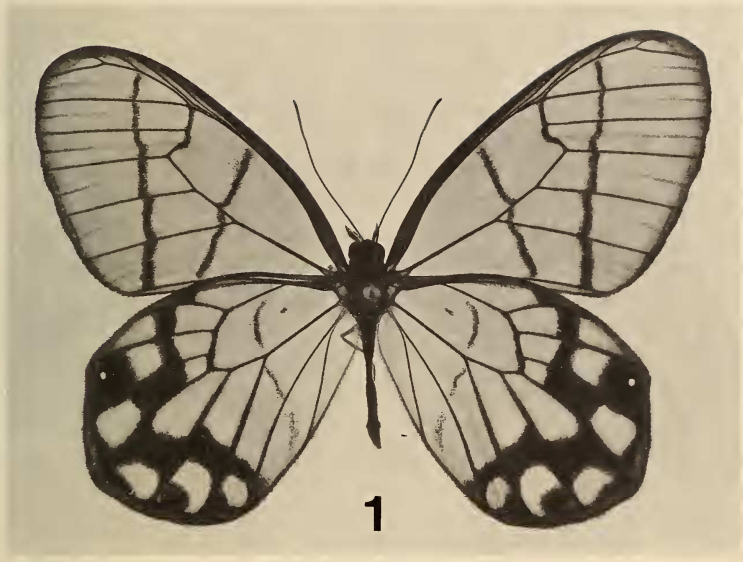
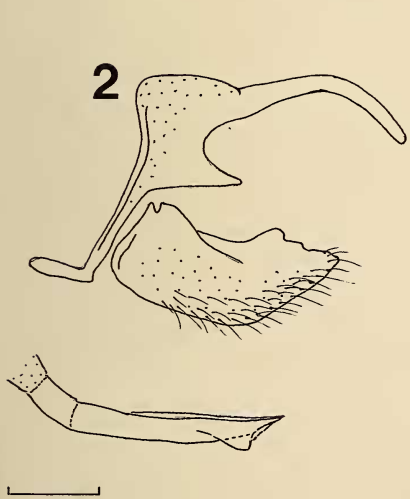
**ABSTRACT.** *Paradulcedo*, new genus, is proposed for the satyrid butterfly originally described as *Callitaera mimica* Rosenberg & Talbot. This little known species, endemic to western Colombia, has long been considered a member of the genus *Cithaerias*, from which it is quite distinct. Descriptions of the wing venation and male genitalia are given. *Paradulcedo* is compared to members of the genera *Dulcedo*, *Pseudohaetera*, *Haetera*, *Cithaerias*, and *Pierella*.

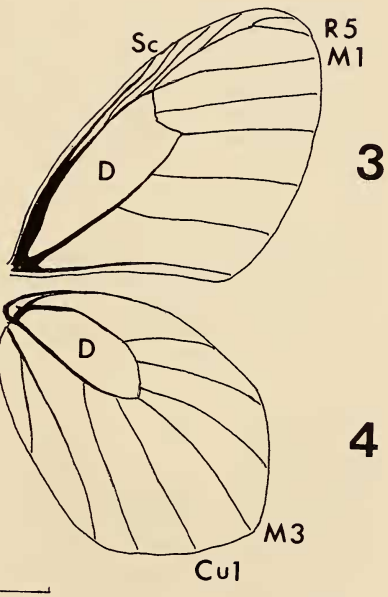
**Additional key words:** *Dulcedo*, *Pseudohaetera*, *Haetera*, *Cithaerias*, *Pierella*.

The tribe Haeterini contains five genera: *Cithaerias* Hübner, *Dulcedo* d'Almeida, *Pseudohaetera* Brown, *Haetera* Fabricius, and *Pierella* Herrich-Schaeffer. All five are confined to the Neotropical Region (Miller 1968, Masters 1970, Smart 1976, D'Abrera 1989) and all occur in Colombia. The butterflies of this tribe are, for the most part, readily distinguished from all other groups of the Satyrinae by having largely transparent wings with one or two ocelli and patches of color on the hindwing margin. The only exception to this description is the genus *Pierella* which has brown coloration on the upper wings and brilliant patches of color on the hindwing distal area with a variable number of ocelli. The genus *Dulcedo* is monotypic containing the single species *D. polita* (Hewitson, 1869) (Fig. 11), which ranges from Nicaragua to Western Colombia (DeVries 1987). The genus *Pseudohaetera* also contains a single species, *P. hypaesia* (Hewitson, 1868), distributed from Colombia to Bolivia (Weymer 1924, Brown 1942, Smart 1976) where it is confined to the Andean region between 1200–2500 m. This species is the only known high-altitude haeterine butterfly found commonly in cloud-forest relicts above 2000 m (Fig. 12). In Colombia, *P. hypaesia* occurs on the east slope of the western cordillera and on the central and eastern cordillera (J. A. Salazar pers. comm.).

In the last ten years, butterfly collectors working on the west side (Pacific slope) of the western cordillera have found a species that closely resembles *P. hypaesia* both in the color markings on the hindwing and in flight behavior. Rosenberg and Talbot (1914) described this species as *Callitaera mimica* from specimens collected at La Selva, located at 1400 m on the upper San Juan River, Chocó, Colombia. This rare and poorly known species, endemic to western Colombia, has been retained in the genus *Cithaerias* virtually since its original description, and was listed in *Cithaerias* by D'Abrera (1989). Takahashi (1981), in a list of Haeterinae collected by two Japanese expeditions to Colombia, did not




FIGS. 1–4. *Paradulcedo mimica* (Rosenberg & Talbot). **1,** ♂ adult, upper side. **2,** ♂ genitalia, lateral view with aedeagus removed (aedeagus, lateral view, beneath). **3,** ♂ forewing venation. **4,** ♂ hindwing venation. Scale lines = 1 mm for Fig. 2 and 5 mm for Figs. 3–4.

mention this species. In the most recent treatment of Neotropical Satyridae (D'Abrera 1989), the male type of *C. mimica* Rosenberg & Talbot is illustrated. Keith S. Brown Jr. (pers. comm.) suggested that *C. mimica* could belong to the genus *Dulcedo* based on superficial observations.

As members of neither *Cithaerias* nor *Dulcedo* are believed to exist above 1500 m in the Andean mountains and because they have distinctive flight behaviors, I began a detailed study to determine the proper generic affinities of *mimica*. Comparisions of the genitalia, wing venation, and adult behavior of *C. mimica* with those of species representing its close relatives, *Dulcedo*, *Cithaerias*, *Haetera*, *Pseudohaetera*, and *Pierella*, suggests that *C. mimica* does not belong to either *Cithaerias* or *Dulcedo*. The results of these studies led to the conclusion that *C. mimica* should be placed in a new genus closely related to *Dulcedo* and *Pseudohaetera*. I therefore propose the following new genus.

## *Paradulcedo* Constantino, new genus
(Figs. 1–4, 5, 10, 22)

**Type species:** *Callitaera mimica* Rosenberg & Talbot, 1914:677.
*Cithaerias mimica* (Rosenberg & Talbot); D'Abrera, 1989:740.
*Cithaerias gilmouri* Okano; Okano, 1986:1.

**Description.** Male and female with same wing color pattern; female larger. **Eyes:** Naked, black-copper in life. **Palpi:** Slender, appressed to head, not extending beyond frontal vestiture; third segment small, one-seventh length of second. **Antenna:** Slender, eight-tenths length of forewing discal cell, comprising 47–48 segments, the terminal 7 slightly compressed without forming a club. **Forewing** (Figs. 1, 3): Completely transparent with two strong lines running across; wing shape rounded (elongated in *Cithaerias*); $M_1$ and $R_{3+5}$ connate at the point of origin from the discal cell (D) (in *Cithaerias* $M_1$ departs from $R_{3+5}$ and not from D; in *Dulcedo* $M_1$ and $R_{3+5}$ arise independently from the discal cell). **Hindwing** (Figs. 1, 4): Transparent with black markings (actually a strong, wide submarginal line) similar to *Pseudohaetera*; viewed ventrally, the markings are brown in *Pseudohaetera*, black in *Paradulcedo*; two ocelli on the hindwing margin (*Cithaerias* and *Dulcedo* have one); $M_3$ curved, originating from discal cell ($M_3$ straight in *Cithaerias*); $Cu_1$ and $M_3$ originating separately from discal cell (arising from same point in *Pseudohaetera* and *Haetera*); discal cell acute distad (rounded in *Dulcedo*). Length of forewing (from base to apex): male, 23.5 to 26.0 mm (n = 11); female, 28.0 to 32.0 mm (n = 6).

**Male genitalia** (Fig. 2): Uncus curved and elongate without lateral projections (in *Dulcedo* there are lateral projections or horns); gnathos small (large and prominent in *Cithaerias*); aedeagus pointed apically (rounded in *Dulcedo*, Fig. 5; Table 1).

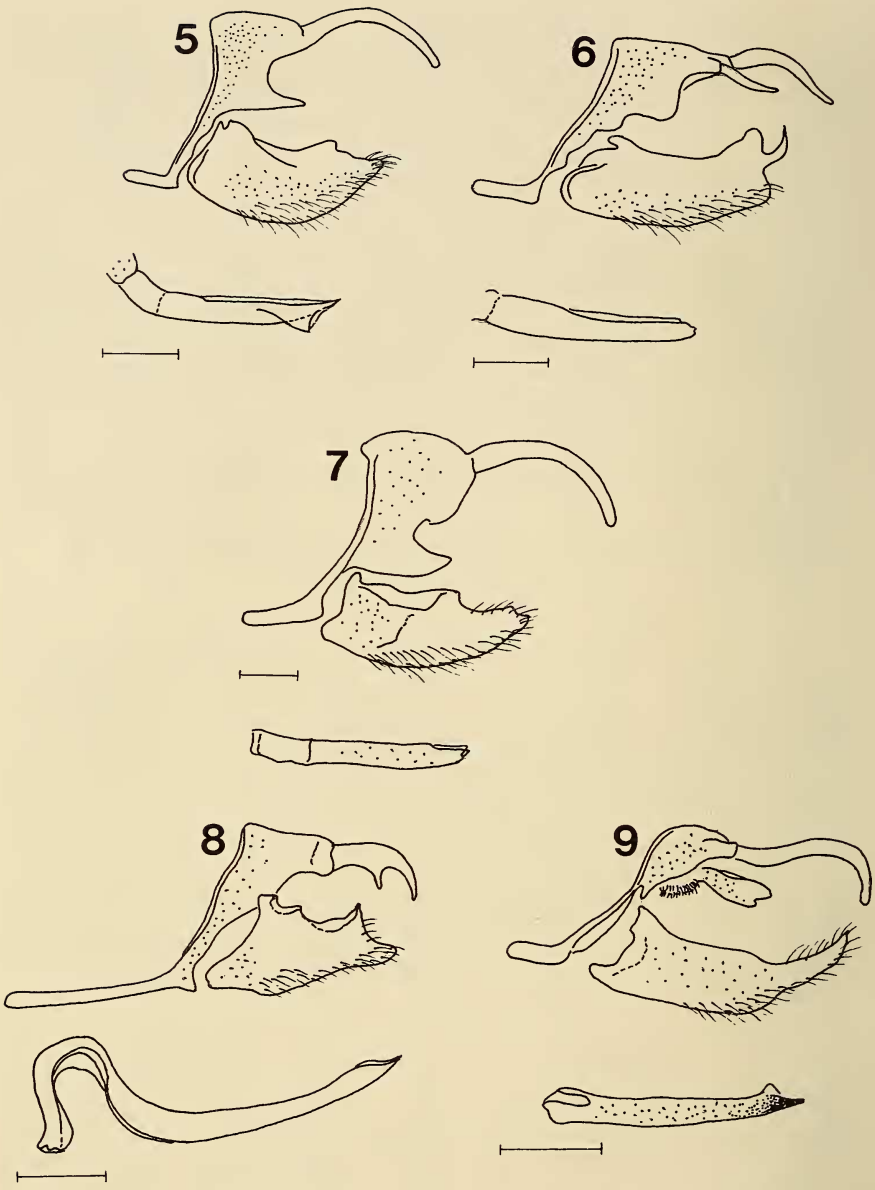
**Relationships.** Morphologically, *Paradulcedo* can be separated from *Cithaerias* by the characters noted in the description above. Although the wing venation of *Paradulcedo* shows affinities with *Dulcedo*, differences in genitalia indicate that they are not congeneric. On the other hand, the genitalia of *Paradulcedo* reveal affinities with *Pseudohaetera*, but the wing venation is quite different.

**Type specimens.** Lectotype, ♂ and ♀ COLOMBIA: Chocó Dept., La Selva (Pacific slope), upper San Juan River, 1400 m (BMNH). Paralectotypes: All from Colombia, 1 ♂, 1 ♀, Risaralda Dept., Pueblo Rico, 1580 m (BMNH); 1 ♂, Risaralda Dept., Siato, 1585 m (BMNH). All type material is in the Natural History Museum, London (BMNH).

**Additional specimens.** COLOMBIA: CHOCO: San José del Palmar, 1000 m, 2 ♂ (J. H. Velez) (Museo de Historia Natural, Manizales), 2 ♀ (J. A. Salazar *leg.*), 1 ♂ (J. F. Lecrom

TABLE 1. Morphological characters to differentiate *Paradulcedo* from *Cithaerias*, *Dulcedo*, *Haetera*, *Pseudohaetera*, and *Pierella*.

| Character | Genus | | | | | |
|---|---|---|---|---|---|---|
| | *Paradulcedo* | *Cithaerias* | *Dulcedo* | *Haetera* | *Pseudohaetera* | *Pierella* |
| Hind wing venation | $M_3$ curved | $M_3$ straight | $M_3$ as in *Paradulcedo* | $M_3$ with curve very pronounced | $M_3$ with curve less pronounced | $M_3$ curve as in *Haetera* |
| | $Cu_1$ and $M_3$ from the discal cell departing separately | $Cu_1$ and $M_3$ separated at origin | $Cu_1$ and $M_3$ separated at origin | $Cu_1$ and $M_3$ connate at origin | $Cu_1$ and $M_3$ connate at origin | $Cu_1$ arises from $M_3$ |
| | Discal cell (D) acute distad | D more elongated than *Dulcedo* and *Paradulcedo* | D rounded distad | D wider than *Pseudohaetera* | The point where $M_3$ and $Cu_1$ depart is more acute than in *Haetera* | D small and very acute distad |
| Number of ocelli | 2 | 1 | 1 | 2 | 2 | Variable |
| Male genitalia | Uncus curve and elongate | Uncus long and curve apically | Uncus curve and elongate. There are lateral horns | Uncus short and curve. Has a tooth | Uncus curved and elongate as in *Paradulcedo* | Uncus short and slightly curved |
| | Gnathos small, not visible laterally | Gnathos large and prominent | Gnathos small | Gnathos small | Gnathos small | Gnathos small |
| | Aedeagus straight and apically pointed | Aedeagus straight and pointed; tip heavily sclerotized | Aedeagus rounded apically | Aedeagus long and n-shaped basally; pointed apically | Aedeagus straight and rounded apically | Aedeagus straight and rounded apically |
| Wing color | Upper wing with two bands. Hindwing, transparent with a wide black submarginal line | Hindwing transparent with patches of color | Hindwing transparent with narrow submarginal lines | Transparent with a slight patch of color on hindwing | Upper wing with one band. Hindwing transparent with a strong black submarginal line as in *Paradulcedo* | Upper wings brown with patches of color on hindwing |




FIGS. 5–9. Male genitalia comparisons of five haeterine genera from Colombia. **5,** *Paradulcedo mimica* (Rosenberg & Talbot) lateral view of genitalia with aedeagus removed (aedeagus, lateral view, beneath) Alto Calima, Valle. **6,** *Dulcedo polita* (Hewitson), Alto Anchicayá, Valle. **7,** *Pseudohaetera hypaesia* (Hewitson), Peñas Blancas, Farallones de Cali, 2000 m. **8,** *Haetera piera* (Linnaeus), Rio Amacayacu, Amazonas. **9,** *Cithaerias aurorina* (Weymer), Puerto Nariño, Amazonas. Scale lines = 0.5 mm.

*leg.*); El Tabor, 1 ♂ (J. F. Lecrom *leg.*); RISARALDA: Santa Cecilia, 900 m, 1 ♀ (J. H. Velez) (MHNM); San Antonio del Chami, 1600–2000 m, 2 ♀ (J. A. Salazar *leg.*); VALLE: Rio San Juan, km 56, 1200 m, 2 ♂, 6. viii. 1985 (L. M. Constantino *leg.*); Calima III, 1400 m, 1 ♂, 16.v.1984 (E. Constantino *leg.*); Alto Rio Pepitas, 1600 m, 1 ♂, 15.vi.1986 (M. Linares *leg.*); cerro Los Chancos, 1600 m, 2 ♂, 1 ♀, 10.vii.1983 (J. I. Martinez *leg.*); Rio Bravo, Calima, 1300 m, 1 ♂, 12.iv.1985 (L. M. Constantino *leg.*).

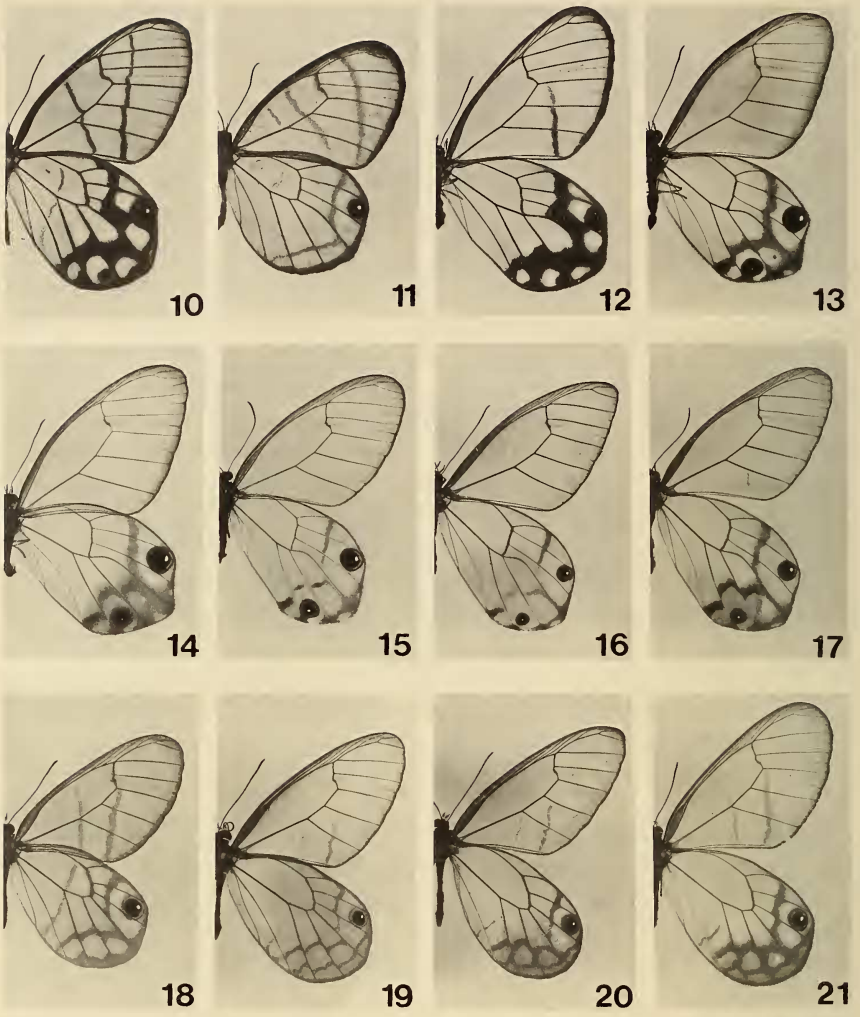
## Natural History

*Paradulcedo mimica* is restricted to undisturbed premontane and montane forest (commonly cloud-forest relicts) on the west side (Pacific slope) of the western cordillera between 900 and 1600 m, with a mean annual precipitation of 5000–6000 mm. Its geographic distribution ranges from Chocó to Cauca (Fig. 22). The range may include Nariño and northwestern Ecuador, but there are no specimens reported from these two regions. The flight behavior is very similar to that of *P. hypaesia*, characterized by being slow and erratic, whereas that of *Dulcedo polita* (which occurs locally on the Pacific Coast in association with pluvial forest from sea level to 1000 m) is very fast and straight. Flight activity of *P. mimica* is during day light hours, from 1000 to 1500 h for males and from 1300 to 1600 h for females. The flight period is restricted mainly to the dry season between June and August, but in some years *P. mimica* can be found during the first rainy season between March and May. Despite many hours of field observation, neither courtship nor oviposition activities were observed, so the larval food plant and immatures remain unknown.

## Discussion

My field observations of *P. mimica* over the last five years indicate that it is restricted to a narrow transitional habitat on the Pacific drainage between montane cloud forest and the foothills of the western cordillera. This habitat, which I term the "belt of endemism," shows a high degree of endemism and biotic peculiarity for butterflies, plants (Gentry 1982), and birds (Haffer 1967), in contrast to other areas of Colombia. This perhaps is an indication that *P. mimica* is an endemic Colombian species. The known distribution of *P. mimica* (Fig. 22) agrees with the "Chocó Quaternary Refugia" proposed for neotropical lepidoptera by Brown (1975). Very likely the Chocó region was a "forest refugium" during pleistocene glaciations (Brown 1982), explaining the occurrence of a high number of endemic butterflies there and in immediately adjacent areas. The Chocó region is located on the Pacific slopes of the western cordillera of Colombia from north of Quibdó to near Lago Calima, across Upper Atrato and San Juan River systems, and its influence is seen as far south as central-western Ecuador (Brown 1975).

Although *P. mimica* was so named because of the black markings of




FIGS. 10–21. Wing venation of some haeterine species from Colombia. Note the shape variation of the hind wing discal cell and the vein $M_3$ for each genus. **10,** *Paradulcedo mimica* (Rosenberg & Talbot) ♂, Alto Calima, Valle. **11,** *Dulcedo polita* (Hewitson) ♀, Rio Tatabro, Bajo Anchicayá, Valle. **12,** *Pseudohaetera hypaesia* (Hewitson) ♀, Peñas Blancas, Farallones, Valle. **13,** *Haetera macleannania* Bates ♂, Rio Tatabro, Valle. **14,** *Haetera macleannania* Bates ♀, Rio Raposo, Valle. **15,** *Haetera piera piera* (Linnaeus) ♀, Leticia, Amazonas. **16,** *Haetrera piera ecuadora* Brown ♂, Puerto Umbria, Putumayo. **17,** *Haetera piera ecuadora* Brown ♀, Orito, Putumayo. **18,** *Cithaerias menander* (Drury) ♂, Rio Sabaletas, Valle. **19,** *Cithaerias aurorina* (Weymer), ♂, Puerto Nariño, Amazonas. **20,** *Cithaerias pyritosa* ssp. (Clifton ms.) ♂, Villavicencio, Meta. **21,** *Cithaerias pyritosa* ssp. ♀, same locality.

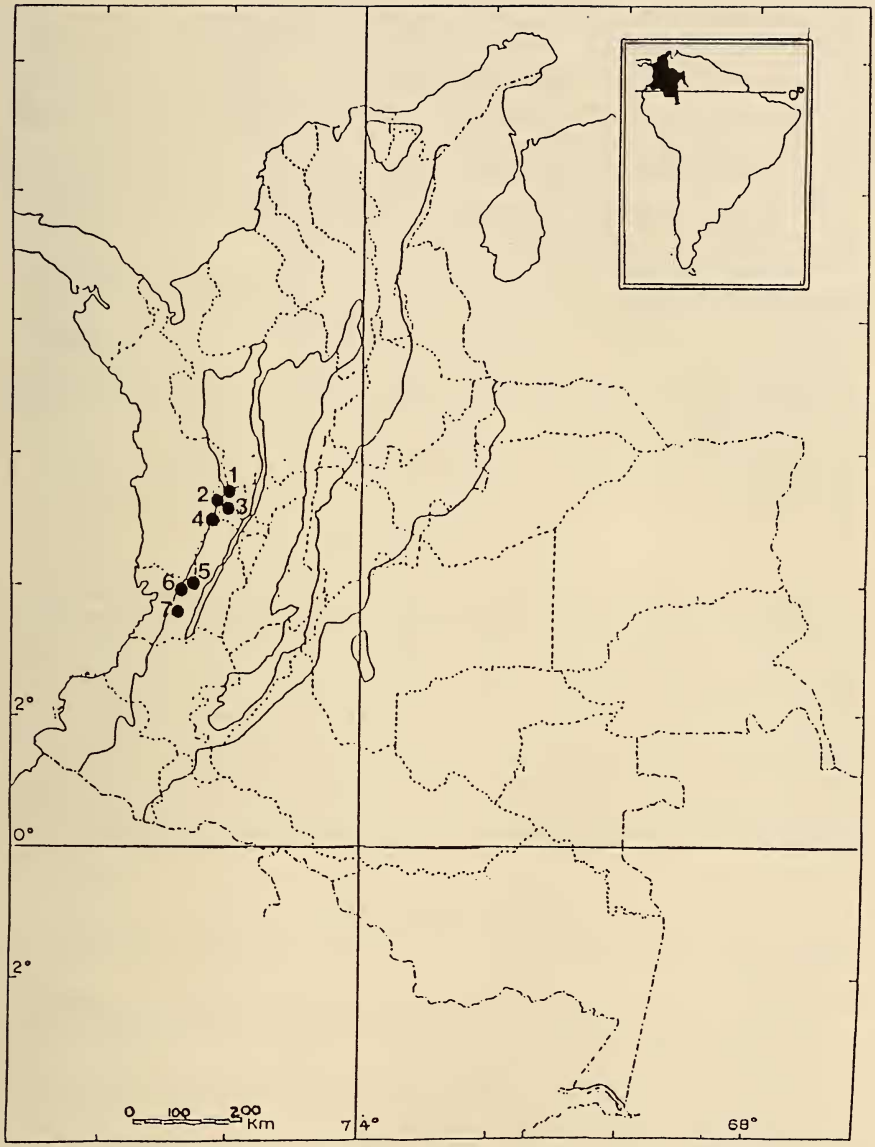



FIG. 22. Known distribution of *Paradulcedo mimica* in Colombia. **1,** Risaralda, San Antonio del Chami, 1600–2000 m. This locality is the farthest north known for *P. mimica*. The habitat where the collections were made is on the upper Mistrato River in montane cloud forest. **2,** Risaralda, Santa Cecilia. On the west side (Pacific slope) of the western cordillera in premontane cloud forest. **3,** Risaralda, Pueblo Rico, 1584 m, the Paratype locality, on the road to Santa Cecilia. **4,** Chocó, San José del Palmar, 1000 m on the Pacific slope in cloud forest. **5,** Valle, Rio Bravo (upper Calima) in premontane and montane cloud forest. **6,** Valle, Cerro los Chancos, near Calima Lake, 1600 m, in montane cloud forest. **7,** Valle, Rio San Juan, km 56 near Queremal, 1200 m, in montane cloud forest.

the hindwing which resemble *P. hypaesia*, there is no evidence of a mimetic association between the two species. The two are parapatric, *P. mimica* occurring on the west slope and *P. hypaesia* on the east slope of the western cordillera. The genera *Dulcedo*, *Paradulcedo*, and *Pseudohaetera* are monotypic, with the latter two restricted to cloud-forest relicts in the Andean mountains. Lowland rain-forests are the province of the other neotropical Haeterini, *Cithaerias*, *Haetera*, and *Pierella*, with the greatest diversity in the Amazon Basin.

The restriction of haeterine adults to the deep shade of the forest understory (commonly undisturbed rain forests) renders them highly vulnerable to habitat disturbance. Most adults tend to stay within a confined area in the forest at all times. Adults cannot tolerate direct sunlight, and once forests are cleared the species disappear from their natural habitat. In secondary forests, haeterine species are seen rarely or are absent. As a result, *P. mimica* is seriously threatened as most of its natural habitats have been taken over for agriculture and pastures.

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## LITERATURE CITED

BROWN, F. M. 1942. Notes on Ecuadorian butterflies. J. New York Entomol. Soc. 50: 304–333.

BROWN, K. S. 1975. Geographical patterns of evolution in neotropical Lepidoptera. Systematics and derivation of known and new Heliconiini (Nymphalidae: Nymphalinae). J. Entomol. 44:201–242.

——— 1982. Paleoecology and regional patterns of evolution in Neotropical forest butterflies, pp. 255–308. *In* Prance, G. T. (ed.), Biological diversification in the tropics. Columbia Univ. Press, New York. 714 pp.

D'ABRERA, B. 1989. Butterflies of the Neotropical Region, Part 5, Nymphalidae (Conc.) and Satyridae. Hill House, Victoria, Australia. 202 pp.

D'ALMEIDA, R. F. 1951. Ligeras observacoes sobre o genero *Cithaerias* Hübner, 1819, (Lep. Satyridae). Arquiv. Zool. Estado São Paulo 7:493–505.

DEVRIES, P. J. 1987. The butterflies of Costa Rica and their natural history. Princeton Univ. Press, New Jersey. 327 pp.

GENTRY, A. H. 1982. Phytogeographic Patterns as evidence for a Chocó refuge, pp. 112–136. *In* Prance, G. T. (ed.), Biological diversification in the tropics. Columbia Univ. Press, New York. 714 pp.

HAFFER J. 1967. Speciation in Colombian forest birds west of the Andes. Am. Mus. Novit. 2294:1–57.

MASTERS, J. H. 1970. Bionomic notes on Haeterini and Biini in Venezuela (Satyridae). J. Lepid. Soc. 24:15–18.
MILLER, L. D. 1968. The higher classification, phylogeny and zoogeography of the Satyridae. Mem. Am. Entomol. Soc. 24:1–174.
OKANO, K. 1986. Descriptions of two new Neotropical butterflies (Lep: Rhopalocera) with the list of the Neotropical transparent winged Satyridae. Tokurana 12:1–10.
ROSENBERG, W. F. H. & G. TALBOT. 1914. New South American butterflies. Trans. Entomol. Soc. Lond. 1913:671–682.
SMART, P. 1976. Encyclopedia of the butterfly world. Hamlyn, London. 275 pp.
TAKAHASHI, M. 1981. A list of the butterflies of the Haeterinae and Biinae (Lep.: Satyridae) collected by two Japanese expeditions in Colombia and Peru, South America. Tyô to Ga. 32:108–116.
WEYMER, G. 1924. Familie Satyridae, pp. 173–283. *In* Seitz, A. (ed.), Die Gross-Schmetterlinge der Erde. Vol. 5. A. Kernen, Stuttgart.

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